



US009636444B2

(12) **United States Patent**
Burbank et al.

(10) **Patent No.:** **US 9,636,444 B2**
(45) **Date of Patent:** **May 2, 2017**

(54) **FILTRATION SYSTEM FOR PREPARATION OF FLUIDS FOR MEDICAL APPLICATIONS**

(71) Applicant: **NXSTAGE MEDICAL, INC.**,
Lawrence, MA (US)

(72) Inventors: **Jeffrey H. Burbank**, Boxford, MA
(US); **James M. Brugger**,
Newburyport, MA (US)

(73) Assignee: **NXSTAGE MEDICAL, INC.**,
Lawrence, MA (US)

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 404 days.

(21) Appl. No.: **13/861,172**

(22) Filed: **Apr. 11, 2013**

(65) **Prior Publication Data**

US 2013/0228505 A1 Sep. 5, 2013

Related U.S. Application Data

(63) Continuation of application No. 12/296,415, filed as
application No. PCT/US2007/066251 on Apr. 9,
2007, now Pat. No. 8,469,331.
(Continued)

(51) **Int. Cl.**
A61M 1/16 (2006.01)
A61J 1/14 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC **A61M 1/1656** (2013.01); **A61J 1/05**
(2013.01); **A61J 1/1468** (2015.05); **A61J**
1/1475 (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC **A61M 1/1656**; **A61M 1/28**; **A61M 5/1408**;
A61M 5/145; **A61M 39/288**;
(Continued)

(56) **References Cited**

U.S. PATENT DOCUMENTS

2,936,757 A * 5/1960 Trace A61M 1/0013
128/DIG. 24

2,995,334 A 8/1961 Henderson et al.

(Continued)

FOREIGN PATENT DOCUMENTS

DE 8305713 12/1985
DE 19704564 8/1998

(Continued)

OTHER PUBLICATIONS

Pall Corporation, "Selection Guide: Separation Products for Cen-
trifugal and Tangential Flow Filtration", Retrieved from [http://](http://www.pall.com/main/laboratory/literature-library-details.page?id=7046)
[www.pall.com/main/laboratory/literature-library-details.](http://www.pall.com/main/laboratory/literature-library-details.page?id=7046)
page?id=7046 on Jul. 7, 2015.*

(Continued)

Primary Examiner — Katherine Zalasky

Assistant Examiner — Benjamin Lebron

(74) *Attorney, Agent, or Firm* — Potomac Law Group,
PLLC; Mark Catan

(57) **ABSTRACT**

Systems, methods, and devices for preparation of purified
water and medicaments for various uses including blood
treatment are described. Methods, devices, and systems for
creating multiple-treatment batches are described. For
example, a medicament fluid circuit can include a container
with an interior chamber. The container can have a fluid
filling port and a fluid extraction port. Both ports can be
connected to the interior chamber. The filling port can have
two sterilizing filters, each of which has a membrane. The
sterilizing filters can be connected in series the membranes
are separated by a distance of at least 0.5 cm. A first of the
sterilizing filters can have a sealed inlet. The fluid extraction
port can be sealed.

13 Claims, 28 Drawing Sheets

